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Indian Standard

SPECIFICATION FOR POTASSIUM PYROPHOSPHATE FOR ELECTROPLATING

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

May 1989

Indian Standard

SPECIFICATION FOR POTASSIUM PYROPHOSPHATE FOR ELECTROPLATING

0. FOREWORD

0.1 This Indian Standard was adopted by the Bureau of Indian Standards on 12 October 1988, after the draft finalized by the Electroplating Chemicals Sectional Committee had been approved by the Chemical Division Council.

0.2 Potassium pyrophosphate is used as an ingredient of copper electroplating baths especially for through-hole-plating of printed circuits as well as phosphatizing. It may also be employed in baths for electroplating of nickel, zinc, alloys etc and for alkaline cleaning. The salt is industrially produced by thermal dehydration of dipotassium orthophosphate.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard prescribes the requirements and methods of sampling and test for potassium pyrophosphate.

2. REQUIREMENTS

2.1 Potassium pyrophosphate shall be in the form of colourless crystals or white powder, hygroscopic in water, easily soluble in water, insoluble in alcohol and low toxic and shall correspond essentially to the formula $K_4P_2O_7 \cdot 3H_2O$.

2.2 The material shall also comply with the requirements given in Table 1 when tested in accordance with the methods prescribed in Appendix A.

TABLE 1 REQUIREMENTS FOR POTASSIUM PYROPHOSPHATE FOR ELECTROPLATING

Sl No.	Characteristic	Requirements	Method of Test (Ref to Cl No. in Appendix A)
(1)	(2)	(3)	(4)
i)	Potassium pyrophosphate (as $K_4P_2O_7.3H_2O$), percent by mass, *Min*	97·0	A-2
ii)	Matter insolubles in water, percent by mass, *Max*	0·01	A-3
iii)	Chloride (as Cl), percent by mass, *Max*	0·005	A-4
iv)	Sulphate (as SO_4), percent by mass, *Max*	0·05	A-5
v)	Iron (as Fe), percent by mass, *Max*	0·003	A-6
vi)	Heavy metals (as Pb), percent by mass, *Max*	0·002	A-7
vii)	Arsenic (as As), percent by mass, *Max*	0·000 5	A-8
viii)	Orthophosphate (as PO_4), percent by mass, *Max*	0·3	A-9
ix)	Potassium carbonate (as K_2CO_3), percent by mass, *Max*	0·3	A-10

3. PACKING AND MARKING

3.1 The product shall be packed in multiwall paper bags/drums or polyethylene bags not exceeding 50 kg in mass when packed.

3.2 Marking

3.2.1 The containers shall be marked with the following particulars:

a) Name of the product;
b) Name of the manufacturer and/or his recognized trade-mark, if any;
c) Net mass of the product;
d) Date of manufacture; and
e) Batch number.

3.2.2 The containers may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or processors, may be obtained from the Bureau of Indian Standards.

4. SAMPLING

4.1 The method of drawing representative samples of the material and criteria for its conformity with the specification shall be as prescribed in Appendix B.

APPENDIX A

(*Clause* 2.2 and *Table* 1)

METHODS OF TEST FOR POTASSIUM PYROPHOSPHATE FOR ELECTROPLATING

A-1. QUALITY OF REAGENTS

A-1.1 Unless otherwise specified, pure chemicals and distilled water (*see* IS : 1070-1977*) shall be used.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

A-2. DETERMINATION OF POTASSIUM PYROPHOSPHATE

A-2.1 Reagents

A-2.1.1 *Hydrochloric Acid* — 1 N.

A-2.1.2 *Bromophenol Blue Indicator* — Prepared by mixing 0·1 g of the indicator compound and 1·5 ml of 0·1 N sodium hydroxide and diluting to 100 ml with water.

A-2.2 Procedure — Dissolve 50 g of the material, accurately weighed in about 400 ml of water in a 500 ml volumetric flask and make up to the mark. Pipette 50 ml portion of the solution into a 250 ml conical flask, add about 20 ml of water and a few drops of bromophenol blue indicator. Titrate the solution to a *p*H of 3·8 against 1 N hydrochloric acid taken in a burette. A change in colour of the solution from blue-violet to yellow denotes the end-point.

A-2.3 Calculation

$$\text{Potassium pyrophosphate (as } K_4P_2O_7 \cdot 3H_2O \text{), percent by mass} = \frac{19{\cdot}22 \times V}{M}$$

where

V = volume of acid consumed, and

M = mass in g of the material in the aliquot solution for the test.

A-3. DETERMINATION OF MATTER INSOLUBLE IN WATER

A-3.1 Procedure — Dissolve 10 g of the material, accurately weighed in about 100 ml of water in a 250 ml glass beaker and heat on a steam bath for 1 hour with occasional stirring. Filter through a weighed sintered glass crucible (Porosity No. 4) and wash several times with hot water. Dry at 105 ± 2°C. Cool in a desiccator and weigh.

A-3.2 Calculation

Matter insoluble in water, percent by mass $= M \times 10$.

where

M = mass in g of the water insoluble residue.

A-4. DETERMINATION OF CHLORIDE

A-4.1 Reagents

A-4.1.1 *Concentrated Nitric Acid* — *See* IS : 264-1976*.

A-4.1.2 *Silver Nitrate Solution* — approx 0·2 M or 3·4 percent (m/v).

A-4.1.3 *Standard Chloride Solution* — Dissolve 0·33 g of dried sodium chloride or 0·421 g of potassium chloride in 1 litre volumetric flask and make up to the mark. Pipette 10 ml of the solution and dilute it to 1 000 ml in another volumetric flask. One millilitre of this solution contains 0·002 mg chloride (as cl).

A-4.2 Procedure — Pipette out 10 ml of potassium pyrophosphate solution prepared for test (*See* **A-2.2**) in a 50 ml Nessler cylinder, add 3 ml of concentrated nitric acid and 1 ml of silver nitrite solution. Dilute to 50 ml with water and mix well. Carry out a control test in another Nessler cylinder using 10 ml of standard chloride solution and the same quantities of other reagents.

The material shall be taken as not having exceeded the limit prescribed in Table 1, if the turbidity produced with the material is not greater than that produced in the control test.

A-5. DETERMINATION OF SULPHATE

A-5.1 Reagents

A-5.1.1 *Concentrated Hydrochloric Acid* — *See* IS : 265-1976†.

A-5.1.2 *Barium Chloride Solution* — approximately 0·2 M or 5 percent (*m/v*).

A-5.2 Procedure — Transfer two 50 ml portions of the solution prepared for test (*see* **A-2.2**) into a 400 ml glass beaker, add 5 ml of concentrated hydrochloric acid and dilute to about 200 ml. Heat the solution to boiling and add dropwise, with a pipette, 10 ml of barium chloride solution, while the solution in the beaker is being constantly stirred. Cover the solution with a watch glass and keep it hot for 1 hour, without boiling. Filter the supernatent liquid using gentle suction through a weighed sintered glass crucible (Porosity No. 4). Transfer the precipitate and wash with warm

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*Specification for water for general laboratory use (*second revision*).

*Specification for nitric acid (*second revision*).

†Specification for hydrochloric acid (*second revision*).

water until the washings give a negative reaction for chloride. Dry the crucible and precipitate in an oven at 105 ± 2°C until consecutive weighings give constant values. The mass of the precipitate shall not be more than 0·012 15 g when determined with a microbalance.

A-6. DETERMINATION OF IRON

A-6.1 General — 4-7-Diphenyl 1-1, 10-phenanthroline, also called bathophenanthroline is colorimetrically highly sensitive to ferrous ions in solution. The main advantage of this compound is that it does not react with cations or anions commonly encountered.

A-6.2 Reagents

A-6.2.1 *Concentrated Hydrochloric Acid — See* IS : 265-1976*.

A-6.2.2 *Hydroxylamine Hydrochloride Solution* — 10 percent (*m/v*).

A-6.2.3 *Sodium Acetate Solution* — 10 percent (*m/v*).

A-6.2.4 *Bathophenonthroline* — 0·082 5 percent (*m/v*) solution in ethanol, absolute alcohol or iso-amyl alcohol.

A-6.2.5 *Standard Iron Solution* — Dissolve 7·012 15 g of ferrous ammonium sulphate [$FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$] or 4·978 1 g of ferrous sulphate ($FeSO_4 \cdot 7H_2O$) with 5 ml of 20 percent (*v/v*) sulphuric acid solution in a 1 000 ml volumetric flask. Pipette 10 ml aliquot of the same and dilute to 1 000 ml in another 1 000 ml volumetric flask. One millilitre of this solution contains 0·01 mg of iron (as Fe).

A-6.3 Procedure — Take a 25 ml portion of the solution prepared for test (*See* **A-2.2**) in a 250 ml glass beaker and adjust its *p*H to 4-5 with concentrated hydrochloric acid added dropwise and with the solution being stirred. Add 1 ml of hydroxylamine hydrochloride, 2 ml of sodium acetate and 5 ml of bathophenanthroline. Make up to 50 ml in a volumetric flask and mix. Read at 530 nm against a reagent blank, making use of a photoelectric colorimeter or a spectrophotometer. Determine iron content of the solution by reference to a calibration curve prepared with known quantities of the standard iron solution treated in the same manner as the test solution.

A-6.4 Calculation

$$\text{Iron content (as Fe), percent by mass} = \frac{M \times 100}{2{\cdot}5}$$

where

M = mass in g of material in the aliquot solution taken for the test.

A-7. DETERMINATION OF HEAVY METALS PRECIPITATED BY HYDROGEN SULPHIDE

A-7.1 Reagents

A-7.1.1 *Dilute Hydrochloric Acid* — 20 percent (*v/v*).

A-7.1.2 *Dilute Ammonia Solution* — nearly 25 percent (*v/v*).

A-7.1.3 *Standard Lead Solution* — Dissolve 0·183 g of lead acetate trihydrate in water, slightly acidified with acetic acid in a 1 000 ml volumetric flask, make up to the mark. Dilute one ml of aliquot to 100 ml in another volumetric flask. One millilitre of this solution contains 0·01 mg of lead (as Pb).

A-7.1.4 *Hydrogen Sulphide Gas* — Produced by reaction of ferrous sulphide with dilute sulphuric acid [10 percent (*v/v*)] in a Kipp's apparatus and then passed through water.

A-7.2 Procedure — Pipette out 25 ml of the solution prepared for test (*see* **A-2.2**) into a 250 ml glass beaker, add 5 ml of dilute hydrochloric acid, boil gently for 5 minutes and cool. Add 10 ml of dilute ammonia solution to the beaker. Pass hydrogen sulphide for a few seconds. No turbidity shall be produced and any colour obtained not deeper than that observed when, to a mixture of 5 ml of the standard lead acetate solution and 3 ml dilute acetic acid standard iron solution containing the same quantity of iron as found in test **A-6** is added along with 10 ml of dilute ammonia and water to bring the volume to the same level and hydrogen sulphide passed through for a few seconds.

NOTE — Transfer all the solutions quantitatively to Nessler cylinder for colour comparison.

A-8. DETERMINATION OF ARSENIC

A-8.1 General — An accurate method of arsenic determination is the silver diethyldithiocarbamate method of colorimetric estimation. The red addition compound formed is measured photometrically at any wavelength between 525 and 640 nm.

A-8.2 Reagents

A-8.2.1 *Standard Arsenic Solution* — Bring 0·132 0 g of arsenious oxide into solution with 20 ml of a 10 percent (*m/v*) sodium hydroxide solution in a 100 ml glass beaker. Transfer to a 1 000 ml volumetric flask, dilute to the mark with water and mix well by shaking the solution (1 ml = 0·1 mg As). Introduce 10 ml of this solution into a 1-litre volumetric flask, add 10 ml of concentrated hydrochloric acid, make up to the mark with water and thoroughly mix. One millilitre of this solution contains 0·001 mg Arsenic (as As).

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*Specification for hydrochloric acid (*second revision*).

A-8.2.2 *Ferric Ammonium Sulphate Solution* — Prepare a solution of 84 g of ferric ammonium sulphate [$Fe(NH_4)(SO_4)_2 \cdot 12H_2O$] in water. Make additions of 2 ml of concentrated sulphuric acid and 1 g of sodium chloride and dilute to 1 litre with water. Mix well by agitation with a glass rod.

A-8.2.3 *Potassium Permanganate Solution* — 2 percent (*m*/*v*).

A-8.2.4 *Stannous Chloride Solution* — Dissolve 80 g of stannous chloride ($SnCl_2 \cdot 2H_2O$) in a mixture of 25 ml of water and 75 ml of concentrated hydrochloric acid.

A-8.2.5 *Lead Acetate Solution* — Dissolve 1 g of lead acetate in 100 ml of water. Clear the solution by dropwise addition of concentrated acetic acid.

A-8.2.6 *Lead Acetate Paper* — Saturate 15 cm qualitative grade filter paper with lead acetate solution and place on a watch glass in an oven at 100-105°C to dry. Cut the papers into quarters and store in an airtight container.

A-8.2.7 *Zinc Shot* — Zinc shot of uniform size is to be used. Though shot of different sizes (3-20 mesh) has been successfully used, more uniform gas flow is obtained with 3-6 mesh over a wider range of acid concentration. Treat the shot with 1 : 1 hydrochloric acid so that it assumes a dull grey appearance. Decant the acid and wash zinc particles with acid-free water. Store the clean shot under distilled water.

A-8.2.8 *Silver Diethyldithiocarbamate Solution* — Dissolve 8·26 g of silver diethyldithiocarbamate in 100 ml of pure pyridine.

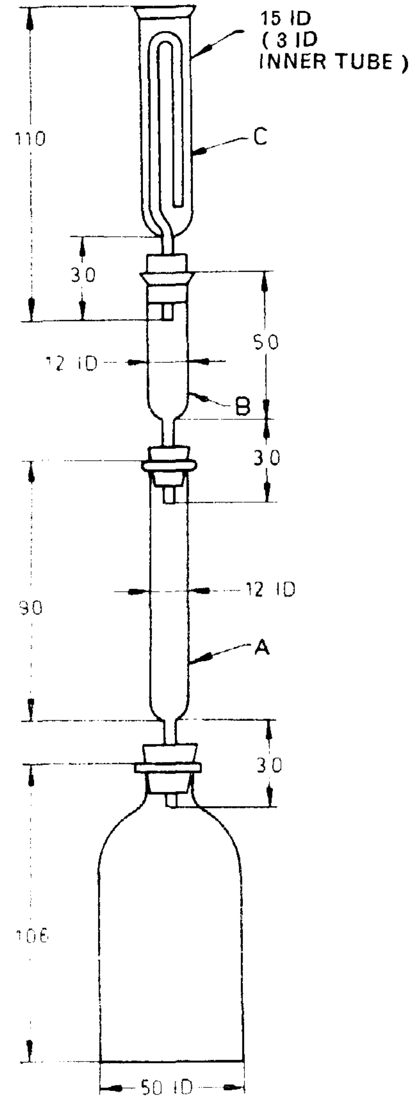
A-8.2.9 *Sodium Chloride* — *See* IS : 797-1983*.

A-8.3 Procedure — Take a 5 ml portion of the solution, prepared for test (*see* **A-2.2**) along with 3-4 ml of concentrated sulphuric acid or 7-8 ml of perchloric acid in the apparatus bottle (*see* Fig. 1), and dilute to 30-40 ml with water.

A-8.3.1 Introduce 10 ml of ferric ammonium sulphate solution and then permanganate solution dropwise to a permanent pink colour. Add 1·5 g of sodium chloride and stir. Heat nearly to boiling, remove from the heat and add stannous chloride solution in order to reduce ferric iron to the ferrous state as shown by disappearance of yellow colour. Add 2 drops of stannous chloride solution in excess, cool and dilute to 60 ml.

A-8.3.2 Set up the apparatus as shown in Fig. 1. Fold a piece of lead acetate paper into a fluted form and insert it into the lower scrubber *A* such that its lower end is nearly 1 cm above the constriction in the tube. Loosely pack the second scrubber *B* with glass wool and moisten the wool with a few drops of lead acetate solution. Remove the excess solution by blowing for a few seconds a stream of compressed air under moderate pressure through the scrubber *B*. Assemble parts *A*, *B*, and *C*. Fill a dry 50 ml graduated cylinder up to 5 ml with zinc shot, pour it into the apparatus bottle and fix the scrubbers and adsorber in position. Pipette without loss of time a 5 ml portion of silver diethyldithiocarbamate into the scrubber *C*. Keep the bottle immersed to the 60-ml mark in a water bath maintained at 27 ± 2 °C for 20 minutes, allowing the reaction to proceed. Remove the adsorber and either transfer to a 3 ml microcell or dilute with a measured volume of pyridine and measure photometrically at 530 nm.

A-8.3.3 Plot a calibration curve with known quantities of arsenic in the usual manner and determine its amount in the test solution.



All dimensions in millimetres.

FIG. 1 APPARATUS FOR SILVER DIETHYLDITHIOCARBAMATE METHOD

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*Specification for common salt for chemical industry (*first revision*).

A-8.4 Calculation

$$\text{Arsenic (as As), percent by mass} = \frac{M_1 \times 100}{M}$$

where

M_1 = mass in g of arsenic in the test solution, and

M = mass in g of the material in the aliquot solution taken for test.

A-9. DETERMINATION OF ORTHOPHOSPHATE

A-9.1 General — An orthophosphate, suitably treated gives rise to (NH_4)$_3PO_4 12\ MoO_3$ which has a characteristic yellow colour.

A-9.2 Reagents

A-9.2.1 *Molybdate Reagent* — Dissolve 10 g of molybdic anhydride or 11·8 g of molybdic acid in a mixture of 40 ml of water and 8 ml of concentrated ammonia solution; filter, if necessary. Slowly add the molybdate reagent with stirring into a solution containing 40 ml of concentrated nitric acid and 60 ml of water; the end of the tube with the molybdate solution shall dip under the surface of the dilute nitric acid. Store the mixture in a warm place for many days or until a portion heated to 40-45 °C deposits no yellow precipitate. Decant the solution from the sediment.

A-9.2.2 *Standard Potassium Phosphate Solution* — Prepare a standard solution of dipotassium hydrogen phosphate trihydrate ($K_2HPO_4 \cdot 3H_2O$) by weighing out 1·201 5 g of the material, dissolving it in water in a 1 000 ml volumetric flask and making up to the mark (1 ml = 0·5 mg PO_4). Shake well.

A-9.2.3 *Ammonium Nitrate, Solid*

A-9.3 Procedure — Pipette 20 ml of the solution prepared for test (*see* **A-2.2**) into a 50 ml conical flask or test tube and add 1 g of ammonium nitrate. Warm the mixture to 40-45 °C and mix 5 ml of the same with the molybdate reagent. Shake the whole solution continuously for 10 minutes and allow to stand for 10 minutes. The intensity of yellow colour of the solution should not be greater than in the case of a standard solution containing ·6 mg of orthophosphate and treated similarly.

A-10. DETERMINATION OF CARBONATE

A-10.1 General — Carbonate in a compound can be determined by subjecting to steam distillation a mixture of the material and dilute sulphuric acid, absorbing the evolved carbon dioxide in sodium hydroxide and titrating the excess hyoroxide against a standard acid solution.

A-10.2 Reagents

A-10.2.1 *Standard Sodium Hydroxide Solution* — 0·05 N.

A-10.2.2 *Standard Hydrochloric Acid Solution* — 0·05 N.

A-10.2.3 *Phenolphthalein Indicator* — 1 percent (*m/v*) solution in 1 : 1 ethanol-water mixture prepared by firstly bringing the solid into solution in ethanol, mixing with an equal volume of water and, if necessary, filtering.

A-10.2.4 *Methyl Orange Indicator* — 0·05 percent (*m/v*) solution, prepared by dissolving 50 mg of the free acid or sodium salt in water, adding 15·2 ml of 0·01 N sodium hydroxide if the salt is used, diluting to 100 ml and filtering to remove any precipitate formed.

A-10.2.5 *Dilute Sulphuric Acid* — 10 percent (*v/v*)

A-10.3 Procedure — Pipette out 50 ml of solution prepared for test (*see* **A-2.2**) into a 500 ml flat bottomed distilling flask carrying a thistle funnel and suitable attachments for steam-distillation. Add about 40 ml of dilute sulphuric acid and cooling the mixture of carbon dioxide and steam by cold water circulation in the condenser and receive the condensate in 20 ml of sodium hydroxide solution. Steam-distil for 30 minutes. Remove the vessel containing sodium hydroxide and carry out titration with standard hydrochloric acid solution first to phenolphthalein end-point and then to methyl orange end-point.

A-10.4 Calculation

$$\text{Potassium carbonate (as } K_2CO_3\text{), percent by mass} = \frac{0{\cdot}69 \times V}{5}$$

where

V = volume of acid consumed beyond phenolphthalein end-point.

APPENDIX B

(*Clause* 4.1)

SAMPLING OF POTASSIUM PYROPHOSPHATE FOR ELECTROPLATING

B-1. GENERAL REQUIREMENTS OF SAMPLING

B-1.0 In drawing, preparing, storing and handling test samples, the following precautions and directions shall be observed.

B-1.1 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

B-1.2 To draw a representative sample, the contents of each container selected for sampling shall be mixed as thoroughly as possible by suitable means.

B-1.3 The samples shall be placed in suitable, clean, dry and air-tight glass or other suitable containers on which the material has no action.

B-1.4 Each sample container shall be sealed air-tight after filling and marked with full details of sampling, the date of sampling and the year of manufacture of the material.

B-2. SCALE OF SAMPLING

B-2.1 *Lot* — All the containers in a single consignment of the material drawn from a single batch of manufacture shall constitute a lot. If a consignment is declared or known to consist of different batches of manufacture, the containers belonging to the same batch shall be grouped together and each such group shall constitute a separate lot.

B-2.1.1 Samples shall be tested from each lot for ascertaining conformity of the material to the requirements of the specification.

B-2.2 The number (n) of containers to be chosen from a lot shall depend on the size of the lot (N) and shall be in accordance with Table 2.

TABLE 2 NUMBER OF CONTAINERS TO BE SELECTED

LOT SIZE	NUMBER OF CONTAINERS TO BE SELECTED
(N)	(n)
(1)	(2)
Up to 50	3
51 ,, 100	4
101 ,, 150	5
151 ,, 300	7
301 and above	10

B-2.3 All the containers shall be selected at random and in order to ensure the randomness of selection, procedures given in IS : 4905-1968* may be followed.

B-3. TEST SAMPLES AND REFEREE SAMPLE

B-3.1 Preparation of Test Samples

B-3.1.1 Draw with an appropriate sampling instrument a small portion of the material from different parts of each container selected. The total quantity of the material drawn from each container shall be sufficient to conduct the tests for all the characteristics given in **2** and shall not exceed 500 g.

B-3.1.2 Thoroughly mix all portions of the material drawn from the same container. Out of these portions a small but equal quantity shall be taken from each selected container and shall be well mixed up together so as to form a composite sample weighing not less than 200 g. This composite sample shall be divided into three equal parts, one for the purchaser, second for the manufacturer and the third to be used as referee sample.

B-3.1.3 The remaining portions of the material from each container (after a small quantity needed for the formation of composite sample has been taken) shall be divided into three equal parts, each part weighing not less than 50 g. These parts shall be immediately transferred to thoroughly dried bottles which are then sealed, air-tight with stoppers and labelled with all the particulars of sampling given under **B-1.4**. The material in each such sealed bottle shall constitute an individual test sample. These individual samples shall be separated into three identical sets of samples in such a way that each set has an individual test sample representing each container selected. One of these three sets shall be sent to the purchaser, another to the manufacturer and the third shall be used as referee sample.

B-3.2 Referee Sample — The referee sample shall consist of the composite sample (*see* **B-3.1.2**) and a set of individual samples (*see* **B-3.1.3**) marked for this purpose. It shall also bear the seals of the purchaser and the manufacturer. These shall be kept at a place agreed to between the purchaser and the manufacturer and shall be used in case of dispute between the two.

B-4. NUMBER OF TESTS

B-4.1 Tests for the determination of potassium pyrophosphate conducted on each of the individual samples for all the grades.

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*Methods for random sampling.

B-4.2 Tests for the remaining characteristics shall be conducted on the composite sample.

B-5. CRITERIA FOR CONFORMITY

B-5.1 For Individual Samples

B-5.1.1 *For Potassium Pyrophosphate* — The test results for potassium pyrophosphate shall be recorded, and the mean and range for these test results shall be calculated as follows:

Mean (X) = Sum of the test results divided by the number of test results, and

Range (R) = The difference between the maximum and minimum values of the test results.

The value of expression (X – 0·6 R) shall be calculated. If the value of this expression is greater than or equal to limits specified in Table 1, the lot shall be declared to have satisfied the requirements for these characteristics.

B-5.1.1.1 In case of sample of size 10, the first five test results may be taken in one group and the next five in another group. R shall be calculated for each of the groups and the average value of the two shall be calculated as R. If X – 0·6 R is greater than or equal to the limits specified in Table 1, then the lot shall be declared to have satisfied the requirements for these characteristics.

B-5.2 For Composite Sample — The test results on the composite sample shall meet the corresponding requirements specified in Table 1.

B-5.3 A lot shall be declared as conforming to the specification if it satisfies the requirements for each of the characteristics listed in Table 1.

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